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**Can We Get There From Here? RMAs, Network-Centric Warfare and  
the Process of Transformation**

By

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Abstract of

CAN WE GET THERE FROM HERE? RMAs, NETWORK-CENTRIC WARFARE AND THE  
PROCESS OF TRANSFORMATION

Among the 'hot' buzzwords in U.S. military circles at present are the Revolution in Military Affairs (RMA) and Network-Centric Warfare (NCW). RMA enthusiasts and technocrats argue that by harnessing emerging information technologies the U.S. can achieve "Information Dominance" in the battlespace of tomorrow, and fundamentally change the nature of warfare. The RMA is comprised of three elements — technology, doctrine, and organizational adaptation — encompassed in the perceived strategic context.

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Although the means of conducting war will change, the nature of it will not. The key to successfully formulating, implementing, and realizing any RMA will be the investment of our intellectual capital along the path. There is no such thing as the 'foreseeable future' and we must not lock ourselves into a course with no allowable deviation but rather critically assess the who, what, when, why, where and how as we move into the 21<sup>st</sup> century. We cannot wait for someone else to solve the problems for us — rather we must all be involved to 'Get There From Here'.

Inferiors revolt in order that they may be equal, and equals that they may be superior. Such is the state of mind which creates revolutions.

Aristotle, *Politics*

Since the fall of the Berlin Wall in 1989 and the collapse of the Soviet Union in 1991, the U.S. defense community has struggled to find, and define, its changing roles and missions in a post Cold War world. For almost half a century the U.S. was able to frame its political and military strategy, make appropriation decisions, and structure its military forces to counter the Soviet threat and maintain balance in a bipolar world. With no peer competitor to focus our attention and prioritize our actions, and none on the visible horizon, the services are fighting diminishing budgets and force reductions in an effort to maintain forces capable of responding to the nations requirements today and into the 21<sup>st</sup> century. There is much debate on how we should invest in the present in order to prevail on the battlefield of the future. Should we spend our diminishing defense dollars on readiness, training and quality of life (QOL) initiatives to be prepared for crisis today or should we cash in our 'peace dividend' and modernize our forces to prepare for the "Evil Empire" of the next millennium? Can we afford to do both? In Washington and academic circles much of the focus of this debate has centered on the evolving Revolution in Military Affairs (RMA) based on "an ability to acquire, process, disseminate, and use information at an unprecedentedly rapid rate" derived from emerging Information Technology (IT).<sup>1</sup> The key to this debate is whether or not these evolving technologies actually add up to an RMA — if they do, then what does it mean for U.S. military force structure, organization, doctrine, and operational art? Are we faced with an either/or situation or is "the best course of action...a much more measured one, combining the prudent modernization of...assets, introspective self-examination, overtures for multilateral cooperation, and steady progress towards reliable strategic defense capabilities?"<sup>2</sup>

The advocates of the RMA contend that by harnessing these emerging technologies the United States will be able to attain "information dominance" which will result in eliminating friction and the "fog of

war”, and increasing friendly situational awareness. This information dominance, or Dominant Battlespace Knowledge (DBK), will enable U.S. forces to “lockout” enemy options by operating within the opponents OODA\* loop, or decision cycle, thereby promising “the capacity to use military force without the same risks as before.”<sup>3</sup>

The emerging RMA comes with different labels and nuances, but the focus of this paper will be on VADM Cebrowski and Mr. Garstka’s concept of the move from military operations that are focused on platforms, or platform centric, to Network-Centric Warfare (NCW) — the conjunction of advanced communications, sensors, and weapons systems networked together to form a whole much greater than the sum of their individual parts. To set the backdrop for my argument I will first define the RMA, provide a basic framework of Network-Centric Warfare and speculate on possible ramifications, unintended consequences and questions. My intent is not to use my crystal ball to predict the future or pretend I have all (or any of) the answers, but rather to raise issues and provide food for thought as we collectively move on the path toward *Joint Vision 2010* and beyond.

## **The Revolution in Military Affairs**

Much of what its proponents have previously written on the subject of a revolution in military affairs falls into two main camps. On the one hand has been the more academic or theoretical side which has focused on the definition of the term itself, the required components, its historical significance, and implications for the future of conflict. This camp focuses on the RMA as a “process for transformation” and provides a conceptual framework for moving forward into the next century. The second camp, most notably championed by the former Vice Chairman of the Joint Chiefs ADM William Owens, takes the information RMA to “its extreme form” focusing on an outcome where the commander will be able to “see and understand everything on a battlefield...if you see the battlefield, you will win the war.”<sup>4</sup>

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\* OODA loop = Observe, Orient, Decide, Act

The term revolution in military affairs gained its prominence after the Gulf War, an event which many experts used as 'Exhibit A' that a Military Technological Revolution (MTR) had occurred. A revolution that demonstrated, "the effects of technology — in precision guided weapons, in stealthy delivery systems, in advanced sensors and targeting systems, in battlefield management platforms — is transforming and in fact already has demonstrably transformed the way in which armed forces conduct their operations."<sup>5</sup> However, the term MTR denotes "an inordinate emphasis on the importance of technology at the expense of other elements of revolutionary change." For this reason, Revolution in Military Affairs became the "preferable term as it places the focus on the *revolution*, and implicitly assigns *technology* a supporting role."<sup>6</sup> But what is an RMA, and does the NCW concept fit the bill or has the desire for more high-tech panaceas simply been more eloquently presented and packaged in the guise of a revolution in military affairs? In other words, in the absence of the Communist threat is NCW simply an "incremental outgrowth of the familiar", an attempt to justify more high-tech gadgets to fight conflict which fits our 'comfort zone' being passed off as something it is not?<sup>7</sup>

Webster defines a revolution as "a sudden, radical, or complete change...an activity or movement designed to effect fundamental changes in the ... situation."<sup>8</sup> Revolutions entail complete changes in methods and conditions, altering the fundamental tenets which define our society, or in our case organization. In current military parlance, a revolution in military affairs equals a large scale, across the board paradigm shift to how we view and prosecute war. In 1993, the Center for Strategic and International Studies (CSIS) defined a revolution as, "a fundamental advance in technology, doctrine or organization that renders existing methods of conducting warfare obsolete."<sup>9</sup> Authorities on the subject use phrases such as "a fundamental change in the nature of warfare" and consider the "magnitude of change compared with preexisting capabilities" when defining a revolution in military affairs.<sup>10</sup> Others, arguing that the nature of war is a constant, further stipulate that an RMA occurs, "when the application of new technologies into a significant number of military systems combines with innovative operational concepts

and organizational adaptation in a way *that fundamentally alters the character and conduct of a conflict*. It does so by producing a dramatic increase — often an order of magnitude or greater — in the combat potential and military effectiveness of armed forces.”<sup>11</sup>

Most, if not all, the writers on the RMA agree, at least on paper, that a revolution in military affairs is composed of a least three components — new technology (including both the technology and its integration into military systems), organizational change or adaptation, and doctrinal change (including the introduction of new operational concepts) — but few attempt to explicitly weight the importance of the sides of this ‘RMA Trinity’. Rather they implicitly shift the respective balance in order to support their arguments, stressing the importance of a single side while minimizing the importance of the other two. Despite the claims, in almost all cases, the focus remains the importance of new technology over the larger, and perhaps more revolutionary, changes required in doctrine and organization.

A historical review of previous revolutions in military affairs shows that the difficulty in defining the RMA is due to the fact that there is no set model, checklist, or cookbook which lays out a road map for us to follow. Indeed, as Jeffrey Cooper elegantly states in “Another View of the Revolution in Military Affairs” there are at least three distinct models to be culled from the past. The first is “impelled by new, purely military technology, driven by fundamental scientific or technological developments”, for example the introduction of the longbow or the invention of gunpowder. The second is best illustrated by the German *Blitzkrieg* of the inter-war period, an operational and organizational innovation in response to a strategic problem (the two front dilemma). The third is “driven by fundamental economic, political, and social changes outside the immediate military domain” as characterized by the Napoleonic France *levee en masse*.<sup>12</sup> All three are characterized by dramatic breaks or “fundamental discontinuities” with the existing status quo.<sup>13</sup> The Information RMA, whether it is the “American RMA” characterized by the “system of systems” advocated by ADM Owens or Network-Centric Warfare, seem to lean heavily on the high profile technological side of the ‘RMA Trinity’ while paying passing lip service to the remaining sides.<sup>14</sup>

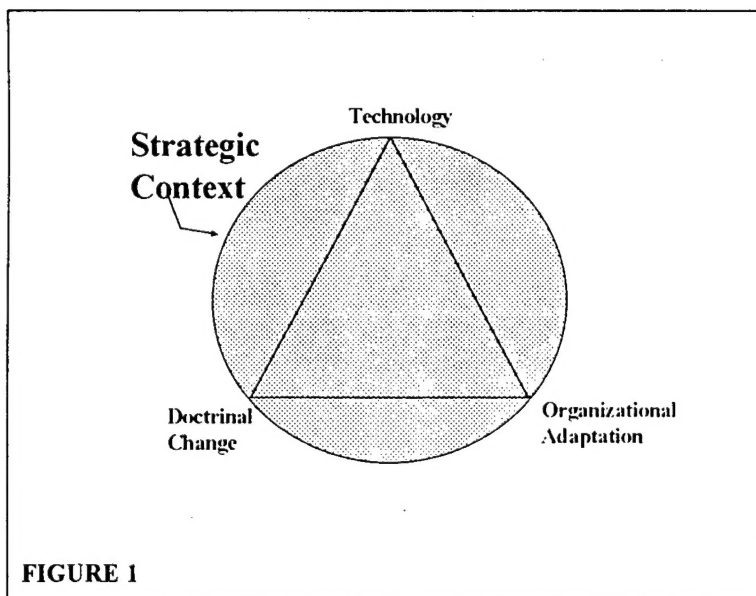
However, as Williamson Murray points out, “History suggests...that the three most important elements in virtually all past RMAs were not technological in nature, but rather conceptual, doctrinal, and intellectual.”<sup>15</sup>

The missing link in most RMA arguments is the strategic one. As Clausewitz taught us, “war is the continuation of politics by other means” and “if war is part of policy, policy will determine its character.”<sup>16</sup> So how will the U.S. military forces be employed in the 21<sup>st</sup> century and for what objectives? Who may our adversaries be and what may future conflict look like? Both the “system of systems” and NCW seem to be narrowly focused on combating a large scale, conventional enemy with little or no mention of their utility across the rest of the operational spectrum. Can they accomplish General Shelton’s goal for *Joint Vision 2010*, “to produce revolutionary changes and transform the U.S military into a force that exploits new systems, doctrine and operational concepts to achieve full-spectrum dominance — the ability to dominate any opponent across the range of operations in peacetime, crisis, and if necessary, war?”<sup>17</sup> Or are we crafting an RMA to create future forces more capable of fighting the wars of the past rather than those of the future — are we headed ‘Back to the Future’? Indeed statements that “the commitment on direction is clear and, I believe irrevocable... (but) we currently lack a firm consensus on two dimensions of this American revolution. The first is what it means, more specifically for military organization and doctrine. The second is what it means for U.S. foreign policy and our role in the world” shows a very narrow operational/tactical focus devoid of strategic context — a characteristic common to most RMA enthusiasts arguments.<sup>18</sup> History, including our own recent experience in Vietnam, is replete with examples where strategic bankruptcy has undone operational excellence and technological superiority — it has been proven it is possible to win the battles but lose the war.

An RMA consists of the development of new system(s) or concept(s) which fundamentally change the context within which war takes place or dramatically alters the methods of its prosecution. To be



successful it must not be developed 'in a vacuum' but in interaction with the domestic and international political environment, potential adversaries and missions, possible political objectives and force capabilities on the strategic level; and blended into a comprehensive operational and tactical doctrine which makes the most of its advantages while minimizing the enemy's ability to exploit its weaknesses. Additionally, the organization must adapt — create new hierarchies, new measures of effectiveness, perhaps even new missions and specialties, etc. — in order to maximize the potential impact and effectiveness of the new system(s) or concept(s). Like strategy itself which both shapes and is shaped by military tactics, a revolution in military affairs must shape strategy and tactics while at the same time being shaped by them.



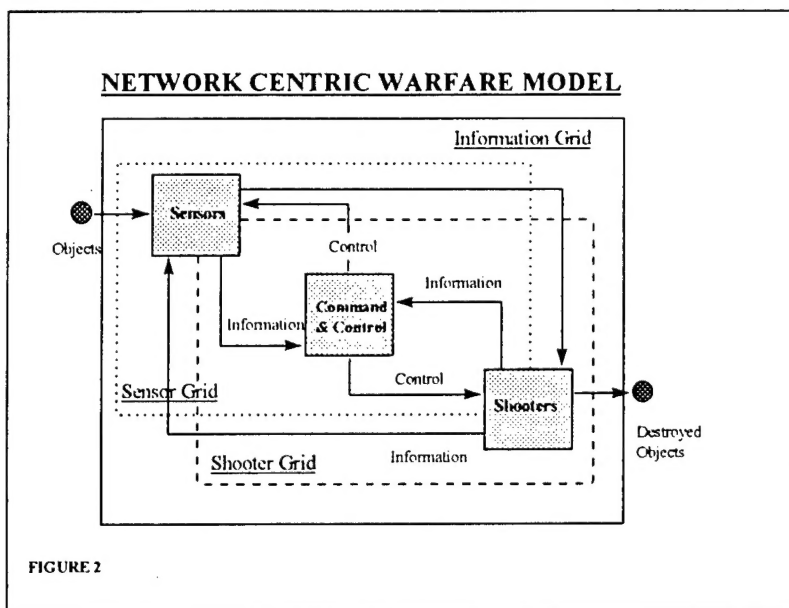
My 'RMA Trinity' (Figure 1) is comprised of the three aforementioned components — Technology, Doctrinal Change, and Organizational Adaptation — encompassed within the strategic context or what Jeffrey Cooper calls the "strategic purpose"<sup>19</sup> Although drawn roughly equal, there are no set relationships or mathematical ratios

among the lengths of the sides — various RMAs will produce various looking Trinities. The length of the sides or the shape of the trinity is not what is important, in fact any attempt to set arbitrary values or relationships to them would be pointless, the key is to "maintain a balance between these three...like an object suspended between three magnets."<sup>20</sup> Likewise, any attempt to formulate and develop an RMA without regard to the strategic environment or landscape, which seems to be the norm, is just as foolhardy.

Without that backdrop how is it possible to envision its utility or critically assess its strengths and weaknesses?

## Network-Centric Warfare

In their article VADM Cebrowski and Mr. Garstka have outlined a compelling argument for the evolving RMA and the future of warfare. Organized largely on an economic model and citing business examples, NCW derives its power from the emerging growth of information technologies and the “fundamental changes in American society” brought about by these technologies as the catalyst for changes to the way the U.S. military conducts operations.<sup>21</sup> Network-Centric Warfare envisions networking geographically dispersed units, platforms, and staffs into a “continuously adapting ecosystem” to create a whole that is infinitely greater than the sum of its individual parts. A network-centric operational structure



(Figure 2) contains “three critical elements: sensor and transaction (or engagement) grids hosted by a high-quality information back plane...supported by value-adding command-and-control processes.”<sup>22</sup>

The shift from platform centric operations to network-centric operations, “enables a shift from

attrition-style warfare to a much faster and more effective warfighting style characterized by the new concepts of speed of command and self synchronization.”<sup>23</sup> By empowering lower echelons through the real-time sharing of information, NCW “enables forces to organize and synchronize from the bottom up — or self synchronize — to meet the commander’s intent.”<sup>24</sup> This self synchronization creates “a dramatically better awareness or understanding of the battlespace” and increases the overall speed of command — the

amount of time it takes an organization between observing something and acting on it.<sup>25</sup> By increasing the speed of command, the authors argue that the “steps” inherent in traditional top-down, command directed, platform-centric operations, “becomes a smooth curve...combat moves to a high-speed continuum” and the OODA loop compresses or disappears.<sup>26</sup> The result, “forces acting with speed, precision and reach achieve the massing of effects versus the massing of forces” and “lock-out” the enemy’s options while “locking-in” success.<sup>27</sup> The bottom line for Network-Centric Warfare: The emerging RMA and network-centric operations promise to create a higher situational awareness, across the force, and allow it to be maintained throughout the conflict to “improve our ability to deter conflict, or prevail if conflict becomes unavoidable.”<sup>28</sup>

To achieve the network-centric RMA VADM Cebrowski and Mr. Garstka also identify four key areas where the DOD must make “fundamental choices.”

(1) “All services must make strategic decisions to maximize future combat power and relevance” in the competitive space of the future.<sup>29</sup>

(2) Intellectual capital: In order to compete on the cutting edge of emerging information technology (the state of the art vs. the state of the shelf) the services must reward Information Technology competence and “merge those with technical skills and those with operational experience.”<sup>30</sup>

(3) Financial Capital: We must move forward to ensure all elements of the Network-Centric Warfare model are realized.

(4) Transformation Process: Currently “technology insertion is ahead of and disconnected from joint and service doctrine and organizational development.” To correctly balance the ‘RMA Trinity’ “a process of co-evolution of technology, organization, and doctrine is required...the objective is to create an ethos for experimentation, innovation, and a willingness to risk across the entire force. Specific top-down experimentation will be required because of cost and size or to establish overarching priorities, but these

are expected to spawn experiments from the bottom up and facilitate cultural and organizational changes.”<sup>31</sup>

## So What?

So far we have discussed the revolution in military affairs and the network-centric view of how this information RMA will transform military operations in the future, based on what it has done in the civilian sector. But does it matter whether NCW is an RMA or is it merely semantics — another example of our never ending quest to quantify things into nice, neat boxes? On paper and in classrooms it may well be an academic exercise in hair splitting, but in the real world of national security stakes are, and will remain, high. RMA advocates warn of the dangers if we fail to pursue the information RMA, that “we may well find ourselves at the mercy of another power who has mastered it”, but what about the dangers of getting it wrong?<sup>32</sup> What happens, if while we pursue the information RMA our enemies, to borrow the phrase from Paul Bracken, pursue ‘the RMA After Next’? Will NCW be able to back up its claims that it “is applicable to all levels of warfare and contributes to the coalescence of strategy, operations, and tactics... It is transparent to mission, force size and composition, and geography?”<sup>33</sup> Or is it a quest for the ‘Technological Holy Grail’, a silver bullet capable of deterring conflict, winning if conflict is unavoidable AND doing so quickly, easily with relatively few casualties.<sup>34</sup> The correct answer may not be an answer at all, but rather more questions — much like taking the outer cover off a golf ball and untangling the string in search of the core. In my opinion, the key to the revolution will be about the search; how we approach the process rather than pursuing a pre-defined outcome.

The first, and most important, question which needs to be asked is, ‘What is the perceived strategic context of the future?’ What types of threats do we envision and what kind of military will we need to deter and defeat these threats? Despite its claims, NCW seems to be focused solely on fighting a conventional, heavily-armored mechanized foe whether it be a true peer competitor (i.e. the former Soviet

Union) or a regional aggressor (i.e. Iraq). Will these be our future challenges or is NCW longing “for an enemy worthy of its technological prowess?”<sup>35</sup> There is another school of thought that believes due to the “decline in the authority, legitimacy, and power of the traditional nation-state”, future threats to the U.S. will not be peer competitors or regional hegemony, but rather sub-national groups, terrorism, and other military operations other than war (MOOTW).<sup>36</sup> In this scenario does NCW “answer that mail” or does it “slow down the U.S. military’s adaptation to a MOOTW world” as some critics suggest?<sup>37</sup> Looking into the future offers no absolutes – it is very likely that both scenarios may be correct or a threat may come out of an unforeseen sector. NCW is clearly focused at the high end of the conflict spectrum and, although the networking of sensors and intelligence would be an asset to MOOTW, it will not be the answer. The key is recognizing that basic fact and framing the RMA within an evolving strategic context, to focus our efforts and chart our course in order to ensure we do not miss a critical fork in the road and waste limited budget resources. Without it we risk looking for “dangers in symmetrical areas and in familiar combinations” and showing up to the next gunfight armed with high-tech knives, or attempting to win the ‘hearts and minds’ using information dominance, stand-off sensors, and precision weapons.<sup>38</sup>

One of the fundamental changes which NCW espouses as central to its increased efficiency and effectiveness is speed of command — “the process by which a superior information position is turned into a competitive advantage.”<sup>39</sup> However, while it may be intuitively obvious that being able to act before your adversary is important, does faster command equal better command? Will future commanders measure their success not on what they accomplish, but how quickly? Will potential preoccupation with speed lead to shortcuts and poor decisions made quickly? The goal — increased speed of command — is fraught with peril and, though the path is one which we will, and ultimately must traverse, we need to ensure we maintain our collective ‘head on a swivel.’ We must avoid being sucked into the belief that more data, over faster networks can be intelligently engineered to reduce the complexities of decision making and reduce the OODA loop to bookends — the creation of an Observe, Act (OA) loop. Nor will it reduce the importance

of experience, judgment, or what Clausewitz called “coup d’oeil.”<sup>40</sup> In fact, numerous studies over the past 20 years have suggested that experts in various fields use intuition as *the* basis for decision making rather than the formal analytical model.<sup>41</sup>

Taken to its extreme, preoccupation with speed of command could add an additional element of friction to the conflict equation, one where we act so fast that we disrupt the reciprocity of war — the enemy does not have time to react and we end up reacting to our own actions. “In short, we could end up like Pavlov’s dog ringing his own bell and wondering why he’s salivating so much.”<sup>42</sup>

Technocrats will argue that advances in automated decision making technologies (both hardware and software) will, in many situations, replace the human in the loop, enabling the order of magnitude increase in speed of command envisioned in NCW. But this argument itself raises more questions about the concept. First, who inputs the data and in what form? If information is acquired that doesn’t fit the desired format is it discounted, or do we “trim the feet to fit the shoes” and possibly skew the output?<sup>43</sup> Second, if more automation is employed to reduce the processing of data and speed up the decision cycle, will certain actions or alternatives be automatically filtered out, or discounted, due to their implausibility or irrationality? Will the network-centric commander of tomorrow dismiss the idea of a German offensive through the Ardennes much like his French counterpart of 1940? Phrased a different way, will the increased reliance on computers and networks have the opposite effect than VADM Cebrowski and Mr. Garstka propose, “locking-in” set, pre-planned responses and “locking-out” flexible, adaptive ones. Computers are amazing machines and their sophistication has increased exponentially, but we must recognize that data and information do not equal knowledge. “The art of operational planning is not acquired automatically with the acquisition of computers” and we must understand the inherent limitations and adjust our organizations and doctrine to enable our greatest asset — the individual soldiers, sailors, airman, and marines — to take advantage of the increased information and technology rather than manipulating them in preset responses.<sup>44</sup> The old adage of ‘Garbage in, garbage out’ still applies.

The other issue of command in a network-centric world is what exactly will it mean? If sensors and shooters are tied together to enable us to scan the battlespace, sift for targets, prioritize and strike them automatically, who will be responsible? Will unit commanders have weapons release authority or will they simply be the pawns on a command center chessboard?

The other fundamental principle to the successful transformation to network-centric operations is self synchronization — “the ability of a well-informed force to organize and synchronize complex warfare activities from the bottom up.”<sup>45</sup> The implication of self synchronization is that by empowering troops via the common operational picture, they will be able to act more quickly and decisively to enhance both the speed and continuity of operations. This also implies a decentralization of control downward — what has been termed “decentralized empowerment” — and a flattening of hierarchies, perhaps the most ‘revolutionary’ part of the network-centric RMA.<sup>46</sup> While self synchronization briefs well and works for Wal-Mart, where the bottom line IS the bottom line, do military operations truly lend themselves to such bottom-up synchronization? Perhaps I lack a visionary’s perception, but I see two impassable hurdles to the concept of self synchronization:

- (1) Given the inherent difficulties involved, can we actually improve the creation and implementation of mission statements, commander’s intent, and rules of engagement (ROE) so that ambiguities will be removed, empowering our forces to act on their information with little direction? And,
- (2) If we can accomplish the aforementioned, will senior political and military leaders be able to provide subordinates their missions, guidance/ROE, intent, and cut them loose?

Indeed, in a world which has been shrunk by the ‘CNN effect’ and global connectivity, and where individual tactical engagements can have strategic, and therefore political, implications the temptations for interference from above may prove to be too great. The speed at which the results of individual or small-unit actions are seen by senior leaders and the U.S. public make it much more likely that any flattening of military hierarchies will be accomplished by cutting out the middle man, mid-grade officers and NCOs such

as demonstrated in HUNTER WARRIOR, and lead to increased centralization of control AND execution.<sup>47</sup> More dangerously, blind trust in the promises of information dominance — “superiority in the generation, manipulation, and use of information sufficient to afford its possessors military dominance” — in the hands of leaders thousands of miles removed from the theater and without an understanding of the nature of war, could lead to a ‘Nintendo version’ of the Vietnam War.<sup>48</sup> With that on the table where does this leave the RMA? In order for NCW to fit the RMA definition and dramatically alter the context or methods of warfare, it depends on the empowerment enabled by information dominance to achieve self synchronization and therefore speed of command. However, if the net result is increased civilianization and centralization of control, is NCW dead on arrival?

If coalition operations will be the norm in the future, another issue which must be addressed is the role of coalitions partners in the network-centric operations of the future? Our allies are already behind us, will they be able to keep up? Will we be able to effectively communicate with our coalition partners or will we be left to choose between (1) leaving them on the outside looking in, content to pick up the scraps from our ‘information table’, or (2) slowing down our operations in order to facilitate cohesive multinational operations? We must address these issues throughout the process to ensure we do not separate ourselves from our coalition partners, create insecurities due to their inclusion, or end up with network-centric forces compelled to fight a platform-centric operation in order to maintain unity of effort.

Does NCW mean the end of Clausewitz and the removal of friction and the “fog of war?”<sup>49</sup> Proponents argue that the fog of war “is in reality, disorder — the inability to maintain unity of action due to shortcomings in the C3I systems”<sup>50</sup> and that the emerging information technologies will eliminate this disorder allowing, “complete knowledge of what all enemy and friendly forces are doing.”<sup>51</sup> Will we recognize ‘information dominance’ when we see it, or will commanders wait (i.e. slow down their decision cycle) in search of better, or more complete, information? Will we lift the “fog of war” as advertised or make it thicker as more and more information arrives faster and faster, overwhelming commanders with too



much noise to discern the signal? We must be careful not to get caught up in the technological hubris of the RMA and unlearn the lessons of the past. Friction — chance, luck, uncertainties, uncontrollable passions, and irrationality — is a constant in war and “the very nature of interaction is bound to make it [war] unpredictable.”<sup>52</sup> We must not underestimate the role of the intangible factors in war and search for linear answers to the nonlinear battlespace of war. Technology is not a panacea and when treated as such (e.g., the U.S. in Vietnam or the Soviet Union in Afghanistan) it cannot succeed.

## **EPILOGUE**

Will NCW change the context within which war takes place or dramatically alter the methods by which it is prosecuted? Will we realize fundamental change in military operations or order of magnitude increases in efficiency and effectiveness that defines an RMA? Obviously only history will write the ending to this story, and the above are just a tiny fraction of the myriad of questions which permeate out of the concept of Network-Centric Warfare — its consequences and perhaps the unintended consequences. There are many dots which need to be connected on the way and the one thing which is certain is that the road ahead will be littered with uncertainty, pot marked with danger, and slippery on the shifting national and international political scenes.

Although the means to conduct war will undergo significant changes in the future, the nature of war — its political goal, its interactive character, and its inherent uncertainty — will not change. The basic components of the subject remain constant — only the details will change. The conjunction of sensors, weapons, and C<sup>2</sup> processes in NCW will undoubtedly improve our ability to conduct conventional warfare more efficiently and jointly. However, claims of eliminating risk, casualties, and friction from war are utopian. NCW utility in a MOOTW environment is also suspect. The revolutionary possibilities of network-centric operations will not be new technologies, but how we integrate them in a synergistic relationship so that they shape, and are shaped, by doctrine, operational concepts, and organizational

adaptation. In order to take advantage of new technologies of the future we need to be fully engaged now, looking not only for answers, but also critically assessing our ideas, concepts, organization, and the fundamental tenets of our military culture. We must be willing to kick over any rice bowl or destroy any fiefdom along the way. The key to successfully formulating, implementing, and realizing any RMA — i.e. changing the details of future conflict in our favor — will be involvement across the services and across the ranks to debate the issues and invest our “intellectual capital” in search of a better way.<sup>53</sup> We must also conduct experiments and exercises which challenge our concepts, doctrine, and technology (including degrading it), looking for the weaknesses and vulnerabilities, rather than simply validating our ‘success’. Network-centric operations are, in one form or another, becoming reality. We can neither deny it nor become prisoners of it. We must ALL debate the merits and vulnerabilities of the concept in order to balance our ‘RMA Trinity’ so we can successfully “Get There from Here.”

## NOTES

<sup>1</sup> Colin S. Gray, "The Changing Nature of Warfare?" Naval War College Review Vol. 49, No. 2 (Spring 1996), p. 8.

<sup>2</sup> Paul F. Herman, Jr., "The Revolution in 'Military Affairs'," Strategic Review Vol. 24, No. 2 (Spring 1996), p. 30.

<sup>3</sup> Mackubin Thomas Owens, "Technology, the RMA, and Future War," Strategic Review Vol. 26 No. 2 (Spring 1998), p. 63.

<sup>4</sup> Owens, Mackubin Thomas, "Technology, the RMA, and Future War, p. 63.

<sup>5</sup> David Jablonsky, "US Military Doctrine and the Revolution in Military Affairs," Parameters Vol. 24, No. 3 (Autumn 1994), p. 19.

<sup>6</sup> Norman C. Davis, "An Information-Based Revolution in Military Affairs," Strategic Review Vol. 24, No. 1 (Winter 1996), p. 43.

<sup>7</sup> Herman, Jr., "The Revolution in 'Military Affairs'," p. 28.

<sup>8</sup> Websters Ninth New Collegiate Dictionary, rev. ed. (1984), s.v. "revolution."

<sup>9</sup> Jablonsky, "US Military Doctrine and the Revolution in Military Affairs," p. 19.

<sup>10</sup> James R. Fitzsimonds and Jan M. Van Tol, "Revolutions in Military Affairs," Joint Force Quarterly No. 4 (Spring 1994), p. 24.

<sup>11</sup> Gray, "The Changing Nature of Warfare?" p. 9.

<sup>12</sup> Jeffrey R. Cooper, Another View of the Revolution in Military Affairs (Carlisle, PA: U.S. Army War College. Strategic Studies Institute, 1994), p. 19-20.

<sup>13</sup> Davis, "An Information-Based Revolution in Military Affairs," p. 44.

<sup>14</sup> William A. Owens, "The American Revolution in Military Affairs," Joint Force Quarterly No. 10 (Winter 1995-96), p. 37.

<sup>15</sup> Williamson Murray, "Clausewitz Out, Computer In: Military Culture and Technological Hubris," The National Interest No. 48 (Summer 1997), p. 63.

<sup>16</sup> Carl von Clausewitz, On War Translated and edited by Sir Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), p. 606.

<sup>17</sup> Henry H. Shelton, "Translating Concepts into Capabilities," U.S. Naval Institute Proceedings Vol. 124, No. 9 (September 1998), p. 29.

<sup>18</sup> Owens, William A. "The American Revolution in Military Affairs," p. 38.

- <sup>19</sup> Cooper, Another View of the Revolution in Military Affairs, p. 36.
- <sup>20</sup> Clausewitz, On War, p. 89.
- <sup>21</sup> Arthur K. Cebrowski and John J. Garstka, "Network-Centric Warfare: Its Origin and Future," U.S. Naval Institute Proceedings Vol. 124, No. 1 (January 1998), p. 32.
- <sup>22</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.32.
- <sup>23</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.32.
- <sup>24</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.32.
- <sup>25</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.32.
- <sup>26</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.33.
- <sup>27</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.32.
- <sup>28</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.33.
- <sup>29</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.34.
- <sup>30</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.35.
- <sup>31</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.35.
- <sup>32</sup> Thomas G. Mahnken, "War in the Information Age," Joint Force Quarterly No. 10 (Winter 1995-96), p. 43.
- <sup>33</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p.33.
- <sup>34</sup> Murray, "Clausewitz Out, Computer In: Military Culture and Technological Hubris," p. 62.
- <sup>35</sup> Thomas P.M. Barnett, "The Seven Deadly Sins of Network-Centric Warfare," U.S. Naval Institute Proceedings Vol. 125, No. 1 (January 1999), p. 36.
- <sup>36</sup> Gray, "The Changing Nature of Warfare?" p. 13.
- <sup>37</sup> Barnett, "The Seven Deadly Sins of Network-Centric Warfare," p. 37.
- <sup>38</sup> Richard Szafranski, "Peer Competitors, the RMA, and New Concepts: Some Questions," Naval War College Review Vol. 49, No. 2 (Spring 1996), p. 115.
- <sup>39</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p. 35.

- <sup>40</sup> Clausewitz, On War, p. 102.
- <sup>41</sup> Paul K. Van Riper and F.G. Hoffman, "Pursuing the Real Revolution in Military Affairs: Exploiting Knowledge-Based Warfare," National Security Studies Quarterly Vol. 4, No. 3 (Summer 1998), p. 8.
- <sup>42</sup> Barnett, "The Seven Deadly Sins of Network-Centric Warfare," p. 38.
- <sup>43</sup> Mao Tse-Tung, Selected Military Writings of Mao Tse-Tung (Peking: Foreign Languages Press, 1967), p. 78.
- <sup>44</sup> James Hazlett and Martin C. Libicki, "The Revolution in Military Affairs," Strategic Forum No. 11 (Washington, D.C.: National Defense University Press, November 1994), p. 3.
- <sup>45</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p. 35.
- <sup>46</sup> James R. Fitzsimonds, "The Cultural Challenge of Information Technology," Naval War College Review Vol. 51, No. 3 (Summer 1998), p. 13.
- <sup>47</sup> Fitzsimonds, "The Cultural Challenge of Information Technology," p. 14.
- <sup>48</sup> Martin C. Libicki, "Information Dominance," Strategic Forum No. 132, (Washington, D.C.: National Defense University Press, December 1997), p. 1.
- <sup>49</sup> Clausewitz, On War, p. 120.
- <sup>50</sup> Davis, "An Information-Based Revolution in Military Affairs," p. 47.
- <sup>51</sup> David C. Gompert, "National Security in the Information Age," Naval War College Review Vol. 51, No. 4 (Autumn 1998), p. 30.
- <sup>52</sup> Clausewitz, On War, p. 120.
- <sup>53</sup> Cebrowski and Garstka, "Network-Centric Warfare: Its Origin and Future," p. 35.

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